pithecus ludio), an African Brush-tailed Porcupine (*Atherura africana*) from West Africa, three Indian Tantali (*Tantalus leucocephalus*) from India, an American Bison (*Bison americanus*) from North America, a Schomburgk's Deer (*Cervus schomburgki*) from Siam, two Side-striped Jackals (*Canis lateralis*) from West Africa, two Spotted Hyænas (*Hyæna crocuta*) from South Africa, two Crested Screamers (*Chauna chavaria*) from Buenos Ayres, five Black-necked Swans (*Cygnus nigricollis*) from Antarctic America, purchased; an Axis Deer (*Cervus axis*), born in the Gardens.

OUR ASTRONOMICAL COLUMN

OCCULTATION OF A FIXED STAR BY SATURN.—It is recorded by Whiston, in his life of Dr. Clarke, that the father of the latter once saw a star in the dark space between the ring and the ball, though, so far as we are aware, no date for the observation or other particulars have been preserved. Gottfried Kirch, the discoverer of the great comet of 1680, appears to have been very nearly a witness of a similar phenomenon, if indeed his telescope had been equal to the occasion. Observing Saturn at Leipsic on the evening of January 16, 1679, he remarked, about 10h., that the star *o* Tauri of Bayer (114 Tauri Fl.), of the sixth magnitude, was distant only one diameter from the extremity of the ring. The night was changeable, and clouds subsequently interfered, but two hours after midnight he found the star "quartâ forsan parte diametri Saturni, a Saturno distantem." A quarter of an hour later he saw that the distance had sensibly diminished, and in another half hour the star had become so small "adeo ut fermè conspectum fugeret. Neque procul aberat a Saturno, ut spatium inter Saturnum et stellulam, ipsius stellæ magnitudinem non superare videretur;" and he continues: "Stellula postea tangebat fermè extremum Saturni." An accompanying rough figure shows the star very nearly in contact with the extremity of the ring. Further we read: "Inter primum et secundum quadrantem post horam tertiam nihil dignoscere poteram, primo stellula Saturno adhæsisse mihi videbatur, de quo tamen nihil certi dicere possum, ipse enim dubito; deinde nihil videndum sese offerabat." But although he saw no more, Kirch states that Saturn would necessarily shortly occult the star. On the following evening, at 8h. 30m., the star was distant about a diameter of the planet, or rather, as the figure shows, of the ring. He considered from these observations that the star was in contact at 3 a.m. on January 17, and that the egress took place about 11 a.m. It will be found that Saturn did not set at Leipsic on this morning until nearly 5h. 30m., and by the track of the planet the central distance at conjunction was less than a third of the semi-diameter of the shorter axis of the ring, thus the star might be within the dark space between the ring and the globe before setting. The planet was then about 83° from the node of the ring, which must therefore have been nearly as open as we can see it. Kirch seems to have been well aware of the rarity of such an observation. It was first published in his Ephemerides for 1683.

THE POLAR COMPRESSION OF MARS.—In November last Prof. Young made a numerous series of measures of the diameters of Mars with a filar-micrometer attached to the 9·5-inch equatorial of the School of Science Observatory at Princeton, New Jersey, U.S., the object-glass of which is stated to be of the highest excellence, having repeatedly shown both satellites of Mars, the two outer satellites of Uranus, and, it is said, the Saturnian satellite Mimas. Although measures with the wire-micrometer have been found liable to considerable constant error, it was thought they might safely be used in determining a difference of diameter. Mr. Marth's ephemeris was employed in setting the position-circle and in computing the minute corrections for phase. The total number of micrometer-readings was 1,140. The results applicable to November 12, 1879, are as follow:—

Equatorial diameter	20″·634 ± 0″·034
Polar diameter	20·552 ± 0·043
Mean	20·593 ± 0·035

These absolute values Prof. Young considered not very reliable, being subject to the considerable constant error referred to above.

Dr. Hartwig's determination of the mean diameter of Mars, by combining all the double-image measures at Königsberg, Leyden, Oxford, Berlin, Paris, and Strassburg, gives for the opposition-diameter in 1879, 19″·128, which differs from Prof. Young's result by 1″·46, which he says is a difference "rather unexpectedly large, but not unprecedented." As regards the compression, the immediate object of the Princeton measures, the final result comes out $\frac{1}{210}$, the limits of probable error extending from $\frac{1}{150}$ to $\frac{1}{301}$. The discussion of the measures was nearly finished, when Prof. J. C. Adams's paper upon the orbits of the satellites of Mars was published; he there gives $\frac{1}{225}$ as the ellipticity of the planet, if it follows the same law of central density as the earth. This near agreement is probably to a considerable extent an accidental one.

Dr. Hartwig's value for the polar diameter of Mars at distance unity is 9″·352, corresponding, with Leverrier's solar parallax, to a real diameter of 4,180 miles.

THE NEXT TOTAL SOLAR ECLIPSE.—At the recent annual meeting of the National Academy of Sciences at Washington, Mr. D. P. Todd, of the office of the *American Ephemeris*, communicated a paper "On the Use of the Electric Telegraph during Total Eclipses applied to the Search for Intra-Mercurial Planets," with the view to illustrate in what manner the rare moments of total eclipses may be utilised to their utmost extent, "the method consisting in the electro-telegraphic transmission of important observations made at western stations to observers at eastern stations, with due speed for their verification or rejection when the lunar shadow reaches the latter stations." Taking as an example the next total eclipse of the sun, on May 16, 1882, it is remarked that the path of totality lies almost wholly on land; commencing in Western Africa, with a northeasterly direction, it crosses Upper Egypt and the Red Sea, passing a few miles south of Bagdad and Teheran, and thence traversing Central Asia, it leaves that continent near Shanghai. Thus several widely-separated regions, connected by telegraphic cables and land lines, are upon the track of the central eclipse. Mr. Todd remarks that from El-Akhmym, on the Nile, a line runs north to Alexandria, from which place Teheran is directly accessible by telegraph. From Teheran a land-line runs southeast through Beluchistan and Hindostan to Madras, which is connected by cable-lines with Singapore, Hong-kong, and Shanghai. He points out that an additional advantage attaches to this eclipse from the circumstance that there is a duplicate line of telegraphic connection between Egypt and Shanghai by way of Constantinople, Vienna, and Moscow, and thence by the Russian line through Siberia to Wladiwostok, and thence to Shanghai. Supposing, then, that an intra-Mercurial planet were discovered during totality in Egypt, a duplicate message might be sent, to insure beyond doubt that the discovery should be known to observers at Shanghai; if a planet were observed at El-Akhmym, 45 minutes of absolute time elapsing before the shadow reaches Teheran, the position might be telegraphed to the latter station so as to give the observer abundant time to verify the discovery, while observations at both places might be telegraphed to Shanghai, which the shadow will not reach until more than two hours after leaving Teheran. Mr. Todd thinks that the telegraph companies, with the courtesy they have always shown in scientific undertakings, would render every assistance in carrying out such a scheme.

We take this outline from a report of his communication to the American Academy, received from Mr. Todd.

BIOLOGICAL NOTES

CHINESE ALLIGATORS.—Two fine examples of the alligator of the Yang-tse-kiang, of the discovery of which we spoke in our issue of February 13, 1879 (vol. xix. p. 351), have recently been received by Dr. Peters for the Zoological Museum of Berlin. There can be no doubt, we understand, that M. Fauvel is quite right, and that this crocodilian is an undoubted *alligator*—being the first of this genus which has been found to occur in the Old World. It will be recollected that of the remarkable Chondrostean genus of fishes, *Polyodon*, one of the two known species is also found in the Yang-tse, while the other is confined to the Mississippi.

FOSSIL CORALS.—The Cyathocrinidæ, as one of the largest and most ancient groups of fossils, appear to belong to a type worthy of attracting continual study. Wachsmuth and Springer (*Proc.* Acad. Nat. Sci., Philad., 1879) unite the genera Poteriocrinus and Cyathocrinus into one family, finding them agreeing in having large oral plates supporting the ambulacral grooves and covering the ventral disk, but leaving an opening at the oral centre, which is perfectly covered by the apical dome plates. Food-grooves along the vault, closed by two rows of alternating pieces; in the presence of a porous ventral sac, located posteriorly, and closed at the top, in which the anal functions were subordinate to other offices; in having the calyx constructed of only three rings of plates alternating with each other, proximal plates sometimes imperfectly developed; no interradials. The extreme genera are very distinct, but there are intermediate forms which render it impossible to make a completely satisfactory distinction between successive genera. It is best, no doubt, to recognise (1) the earlier or embryonic types, including Heterocrinus; (2) the typical Cyathocrinidæ, (3) the Poteriocrinus type, (4) the Teacrinus type, including Woodocrinus, (5) and transitional forms towards Eucrinus, such as *Eupachycrinus*. Little difficulty is found in referring all Cyathocrinidæ from the upper Silurian to the close of the carboniferous to one of the groups Poteriocrinus or Cyathocrinus, although the anal plates vary much in form. In the lower Silurian members of the family this is more difficult, yet careful study gives rise to the idea that the later were probably developed from the earlier Silurian types.

CIRCULATION IN WORMS.—The existence of a double circulatory apparatus in a certain number of types belonging to the class of worms has been known; it consists of a closed vascular apparatus containing a red blood without corpuscles, and of the connected lacunæ of the body (not properly a distinct organic apparatus), containing colourless blood with white corpuscles. From a sealed packet lately opened in the Belgian Academy it appears that M. van Beneden had discovered in 1871 a double apparatus and two sanguineous liquids in the lower Arthropoda; this is found in the genera *Clavella, Congericola*, and *Lernanthropus*. The vascular apparatus with red blood and contractile walls, very simple in the two former, becomes very complex in *Lernanthropus*. The foliaceous lamellæ fixed to the posterior part of the body are true branchiæ, organised exactly like those of annelids. There is no central organ of circulation; the circulation of the two liquids is caused by contractions of the body. In *Lernanthropus* the branchiæ, abdomen, and cephalothorax contract and spread alternately.

LARGE CUTTLE FISH.—All exact information about gigantic Cephalopoda is of interest not only as showing what immense marine creatures do exist, but as preparing us for the possibility of meeting with still greater. Prof. Verrill has collected a great deal of accurate and recent information as to the North American species, of which he publishes a list in the April number of the *American Journal of Science*, from which we cull the following:—On November 2, 1878, a fisherman was out in a boat with two other men near Leith Bay Copper Mine, Notre Dame Bay, when they observed some bulky object not far from shore, which they approached, thinking it might be part of a wreck. To their horror they found themselves close to a large fish having big glassy eyes. It was making desperate efforts to escape, and was churning the water into foam by the motion of its immense arms and tail. Finding it partially disabled, they plucked up courage and threw the boat's grapnel, which sank into its soft body. By means of the stout rope attached to the grapnel and tied to a tree the fish was prevented going out with the tide; its struggles were terrific as, in a dying agony, it flung its great arms about. At length it became exhausted, and as the water receded it expired. Its body, from the beak of the mouth to the extremity of the tail, measured twenty feet, and one of the tentacles, or arms, measured thirty-five feet. This is the largest specimen yet measured of *Architeuthis princeps*. Prof. Verrill mentions eighteen species as now known on the north-eastern coast of America.

STERNUM IN DINOSAURS.—Prof. O. C. Marsh describes, in the *American Journal of Science* for May, 1880, the sternum in *Brontosaurus excelsus*. The Yale Museum has recently received a nearly complete skeleton of this, one of the largest known Dinosaurs. This huge skeleton lay nearly in the position in which the bones would naturally fall after death, and fortunately the entire scapular arch was in excellent preservation. The coracoids were in apposition with their respective scapulæ on each side, and between them lay *two* flat bones that clearly belong to the sternum. This discovery, as interesting as it was unexpected, removes the main uncertainty about the scapular arch of Dinosaurs, and likewise indicates a new stage in the development of this structure, not before seen in adult animals. These two sternal bones are suboval in outline, concave above and convex below. They are parial, and in position nearly or quite joined each other on the median line. The anterior end of each bone is considerably thickened, and there is a distinct facet for union with the coracoid. The posterior end is thin and irregular. The inner anterior margin of each bone is smooth and rounded, and gives no evidence of union with an episternal element, which the vacancy there suggests. The amount of cartilage between these two sternal bones or posterior to them is not indicated by the present specimens. They were evidently separated by cartilage from the coracoids. The nearest analogy among living forms to this double sternum may perhaps be found in immature birds. A close resemblance is apparent in the scapular arch of the young American ostrich. If the ossification of the sternum were permanently arrested at this stage it would afford almost precisely the structure seen in the genus *Brontosaurus;* and this is evidently the true explanation of the fossil specimens. It is more than probable that in many Dinosaurs the sternum long remained cartilaginous, or so imperfectly solidified that it is not usually preserved. Several specimens of the genus *Camptonotus*, found nearly in their natural position, were apparently destitute of an ossified sternum. The large size, and doubtless great age, of the specimen of *Brontosaurus* above mentioned may perhaps have been the cause of its more perfectly developed sternum.

ANTIPATHARIA OF THE "BLAKE" EXPEDITION.—In vol. iv. No. 4 of the *Bulletin* of the Museum of Comparative Zoology at Harvard College, Cambridge, Mass. (February), L. F. Pourtales describes twelve species of this interesting group taken in the Caribbean Sea (1878-79). In determining the species an attempt has been made to use the differences in the shape of the polyps, as well as the disposition and form of the spines to draw characters for a much-needed revision of their classification. It would seem as if there were at least two different types of spines: the triangular compressed and the more cylindrical. These latter are generally more densely set, even assuming sometimes a brush-like appearance, as in *Antipathes humilis*, a new and wonderfully spinous species, figured but not described by Pourtales. These cylindrical spines are also unequal on the two sides of the pinnules, being longer on the side occupied by the polyps, with a few very much longer around the polyps. The triangular spines are disposed regularly in a quincuncial order around the pinnules, and in a cleaned specimen nothing indicates the place formerly occupied by the polyps. In one species, however, *A. desbonni*, the spines are in regular verticils. There would appear to be a connection between the shape of the polyps and the shape and disposition of the spines. Those species with triangular spines have polyps with longer tentacles than those with cylindrical spines, and the tentacles have a greater tendency to become regular in shape. In many species the tentacles are simply contracted; in a very few they were found retracted, as figured by Lacaze-Duthiers; and in some they are probably not retractile at all. Eight out of the twelve named are either described or figured as new species. *A. spiralis* is a very interesting species, formerly referred to *A. desbonni*, D. and M. The polyps are alternately large and small, with very large digitiform tentacles, much longer than have been figured of any antipathes before. In the spaces between successive polyps the cœnosarc shows transverse canals, and those on the back part of the branch are more transparent than the rest.

AMERICAN (EAST COAST) SIPHONOPHORA.—In the March and April *Bulletin* of the Museum of Comparative Zoology at Harvard College, Cambridge, Mass. (vol. vi. 5-7), Mr. J. Walter Fewkes gives a sketch of the development of the tentacular knob of *Physophora hydrostatica*; he describes the mantle-tubes of *Apolemia uvaria* and *Gleba hippopus*, the tubes in the larger necto-calyx of *Abyla pentagona;* he adds some critical remarks on the genera Halistemma, Agalma, and Agalmopsis, and he concludes with a notice of the forms of Siphonophora and Velellidæ, to be met with on the eastern coast of the United States. Up to the present few forms of either of these groups have been described from American waters. They seem to be only occasional visitors blown into the neighbourhood from mid-ocean, and brought there from the tropics by the Gulf Stream. The wealth of such species that one meets with in the Mediterranean is unknown on the New England coast; while, as the author says, in one day at Nice he has taken eight different genera of Siphonophoræ, yet at Newport he has but rarely taken as many as two genera in the length of a summer's day, and a whole summer once passed, during most of which he was almost daily on the water without one species being seen. One or two species of Physalia are, however, more common on the United States coasts than in the Mediterranean. The only member of the long-stemmed Siphonophoræ provided with a float or air-bladder found heretofore on the New England waters is *Agalmopsis cara*. Mr. Fewkes can now add *A. elegans*, and he thinks that extended observation in the southern bays of the country will bring to light some of the well known forms common to all oceans, such as Apolemia, Abyla, Physophora, and Gleba. Some of these have already been taken in the Gulf of Mexico and the Caribbean Sea. Rhizophysa, found in the same localities, might also be expected to be brought to the Eastern American coasts by oceanic currents.

PARASITE ON THE AMERICAN BLUE PIKE.—In the *American Journal of Microscopy* for March, Prof. D. S. Kellicott describes a new species of Argulus found on the blue pike (*Stizostethium salmoneum*, Jord.). The fishermen of the Niagara River at Buffalo say that when the water becomes warm the fish gets too lazy to take food, that it then loses flesh, and through its inertness becomes infested with these lice. Having given this subject especial attention, Prof. Kellicott is inclined to think the account of the fishermen is correct. The parasite occurs usually on the top of the head of the fish. When there are several they are, as a rule, huddled together often in heaps, so that the knife may remove a number at once; it occurs also on the fins. None were found in the mouth cavity. As many as twenty were taken from one lean fish. When living specimens of the Argulus were placed in a tank with a small specimen of *Lepidosteus osseus* and some minnows, they shortly fixed on them, and the minnows soon died, apparently killed by the parasites. When first put in, the fish would pursue and catch them, but would eject them with a suddenness and a queer expression that was most amusing. In a few moments they were left unnoticed by the minnows. The gar recoiled in evident fear when one would be seen approaching. A large female once fastened on to the end of the long nose of the gar, where it clung for several days, despite the vigorous efforts of the fish to dislodge it. Cold weather seemed to destroy them: the fishermen assert that after frosts the blue pike become fat, and then no lice are found on them. The species is called *A. stizostethii*. The author believes—against the assertion of Leydig—that the abdominal lobes have a function of respiration above all other parts of the body, and he describes with a good deal of detail the appendages to the several legs.

MOTION IN ALGÆ.—From some interesting observations recently made by Herr Stahl, as to the influence of light on the motions of algæ (*Verhandl. der phys.-medic. Gesellsch. in Würzburg*, Bd. xiv.) it appears that light has a directive influence on *Closterium moniliferum*, the cell of which tends to place its longitudinal axis in the direction of the light rays, and a certain opposition appears in the two halves of the cell, such that one half is attracted to the light and the other half repelled. Further observation showed that the closteria underwent periodic changes, in virtue of which the two halves alternately at successive intervals turned towards the light. These experiments were made with diffuse daylight of little intensity. When the intensity of the light was increased, the orientation of the closteria was changed; the position parallel to the light rays was given up, and the cells placed themselves at right angles to the incident light. This cross position could be again exchanged for the parallel one by deadening the light. Whether temperature has much to do with these positions of closteria has not yet been determined; the temperature of the minimum seems to be not without action on the period between two reversals. The foregoing experiments should be made with quite healthy vigorous closteria. Some other phenomena of orientation were observed by Herr Stahl in *Micrasterias rotata* and in a species of *Mesocarpus*.

GEOGRAPHICAL NOTES

THE fiftieth anniversary meeting of the Geographical Society was held on Monday afternoon, the Earl of Northbrook presiding. Apart from the flourishing condition of the Society, both numerically and financially, the most interesting feature in the Council's Report was the part relating to the annual grant for scientific purposes. During the past year a plan was put into operation for giving practical instruction to intending travellers in the use of instruments for astronomical observations to fix positions, in surveying, and in the measurement of heights by barometric and hypsometrical methods. This attempt to improve the scientific training of our travellers has already met with considerable success, and several of the pupils who have received instruction have left for China, Afghanistan, Central Africa, Central Asia, &c. In order to facilitate the instruction in astronomical work, an observatory has been built on the roof of the Society's house. The medals and other awards were afterwards distributed by the President, Count Piper, the Swedish Minister, receiving for Prof. Nordenskjöld a copy of a special vote of thanks and his diploma as Honorary Corresponding Member, as well as the royal medal for Lieut. Palander. Mr. W. Giles received the other royal medal for his cousin, Mr. Ernest Giles, and Mr. R. N. Cust the gold watch awarded to Bishop Crowther for his services on the Niger. A copy of a resolution of the Council, eulogistic of his "History of Ancient Geography," was also read and handed to Mr. E. H. Bunbury. The gold and silver medals having been given to the successful candidates in the recent public schools prize examination, the ballot was taken for the new council, resulting in the election of Lord Aberdare as President, and Mr. John Ball, F.R.S., Sir Fowell Buxton, Mr. J. K. Laughton, Sir George Nares, Lord Reay, and Sir Richard Temple, in the place of the retiring members of council. In the course of his annual address Lord Northbrook summed up the results of recent explorations in the Arctic regions, in Asia, and in Africa, as well as of Admiralty surveys in various parts of the world.

HERR VON BOGUSLAWSKI publishes, in the *Annalen der Hydrographie*, the conclusions to which he has been led by recent observations on ocean temperatures:—1. The waters of the North Pacific are in general colder than those of the North Atlantic. 2. The waters of the South Pacific are warmer than those of the South Atlantic, to a depth of 1,300 metres; beyond that they are colder. 3. The bottom temperatures are generally lower in the Pacific than in the Atlantic at an equal depth and in the same degree of latitude; but we do not find any part of the temperature in the former as low as those of the Antarctic part of the South Atlantic between 36° and 38° S. lat. and 48° and 30° W. long., where in seven places temperatures of – 0°·3 to – 0°·6 were found. 4. In the west part of the Pacific and in the neighbourhood of the Indian Archipelago, the temperature of the water reaches its minimum at depths which vary from 550 to 2,750 metres, and remains the same from that depth downwards. In all the Atlantic the temperature from 2,750 metres lowers slowly but regularly.

THE Council of the German African Society has now arranged with the King of Belgium, as president of the International African Association, that, instead of carrying out their former intention of establishing a German station on the southern bank of Lake Tanganyika, their expedition, which is now at Zanzibar, preparing for their tour into the interior, shall first establish a station at Mangasa; that, however, the right to found a second station near Lake Tanganyika shall be reserved to them. Dr. Pogge of Mecklenburg, already well known through his African travels, will become the director of this second station, which will now perhaps be established at Mussumba, the capital of Muata Tamwo. This station will form a link in a complete chain of small settlements which are to extend all over the Dark Continent.

A LETTER in the *Deutsche Zeitung* announces that, after five months of unremitting toil, the Austrian African traveller Marno has been able to break through the obstacles on the White Nile caused by the unchecked growth of twenty months, and has re-opened the navigation for trade and passenger traffic. Accompanied by the photographer Buchta, also an Austrian subject, Marno had made a trial trip on a small steamer belonging to the Egyptian Government, penetrating as far as Ladova, and returning safely.

A LIST of 25,000 geographical terms in most frequent use has been drawn up in Chinese by Li Fêngpao, Chinese Minister at Berlin, with the assistance of Dr. Kreyer and Dr. Allen. This list is the basis upon which a large atlas of the world on Mercator's projection has been prepared and photolithographed at Berlin. It also represents the nomenclature employed by Dr. Kreyer in a translation of Daniel's Geography, a large standard work in sixteen Chinese volumes.

WE regret to learn that Père Horner, who has been a true friend to many an African explorer, died at Bordeaux on May 20. He had but recently returned from Zanzibar, where he had resided for many years, and had taken an active interest in all attempts to put down the slave-trade in Eastern Africa, and in